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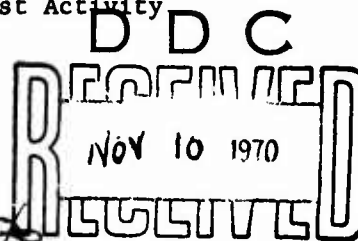
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3 August 1970

Materiel Test Procedure 9-2-203
General Equipment Test Activity

U. S. ARMY TEST AND EVALUATION COMMAND
COMMODITY ENGINEERING TEST PROCEDURE

CUTTERS, FLOOR MOUNTED



1. OBJECTIVE*

This document provides the test methodology and testing techniques to determine the technical performance and safety characteristics of floor mounted cutters and associated tools and equipment as described in Qualitative Materiel Requirements (QMR's), Small Development Requirements (SDR's), and Technical Characteristics (TC's), and to determine the suitability of the items for service tests.

2. BACKGROUND

Floor mounted cutters fulfill the requirement in shop operations of reducing sheet stock to finished size. The ability of these cutters to handle large, heavy stock quickly and accurately enables these machines to operate much more efficiently for this purpose than other machinery such as cutting torches, power saws, etc.

Operation is that of a shearing blade brought down through the work, which has been prepositioned over another fixed shearing blade. This scissors effect enables accurate, square cuts to be made on up to 1 1/2" sheet stack with no finishing machine work necessary. Motive power is supplied either hydraulically or mechanically through worm gear reduction.

3. REQUIRED EQUIPMENT

- a. Transportability Test Facility.
- b. Electromagnetic Interference (EMI) Facility-shielded room or open area.
- c. Sound Anechoic Chamber.
- d. Packaging Facility.
- e. Environmental Testing Facilities.
- f. Dielectric Strength Tester 0-3000VRMS 25-60 Hz.
- g. 500 VDC Megohmmeter.
- h. Miscellaneous Electrical Meters; voltage, amperage, power (AC and DC).
- i. EMI Field Intensity Equipment and Antennas per MIL-STD-461.
- j. Sound Intensity Meter per ASA S1.4-1961.
- k. Octave Band Analyzer per ASA S1.6-1960.
- l. Rate Measuring Equipment - Stroboscope, Voltage Generating Sensors and Compatible Electronic Counter.
- m. Weighing Scales

*This MTP is intended to be used as a basic guide in preparing actual test plans for the subject equipment. Specific criteria and test procedures must be determined only after careful appraisal of pertinent QMR's, SDR's, TC's, and any other applicable documents.

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- n. Temperature Measuring Equipment - thermometers - 0°F, thermocouples and temperature bridge.
- o. Timing Devices, Watches - sweep second.
- p. Surface Fineness Measuring Devices - Profilometer.
- q. Air Flow Meters and Pressure Gauges.
- r. Dial Indicator.
- s. Miscellaneous Hand Tools.
- t. POL Products.
- u. Rulers, 6 and 12 inches graduated in 64ths.
- v. Gear-tooth Caliper.
- w. Square Head Measuring Tool.
- x. Protractors, Bevel.
- y. Precision Micrometers.
- z. Calipers - inside, outside.
- aa. Scribe.
- ab. Straightedge.

4. REFERENCES

- A. Army Regulation 70-38, Research, Development, Test and Evaluation of Material for Extreme Climatic Conditions.
- B. AMCP 706-134, Engineering Design Handbook, Maintainability Guide for Design.
- C. USATECOM Regulation 385-6, Verification of Safety of Materiel During Testing.
- D. USATECOM Regulation 700-1, Value Engineering.
- F. USAGETA Document (HEDGE), Human Factors Evaluation Data for General Equipment.
- G. MIL-STD-129, Marking for Shipment and Storage.
- H. MIL-STD-130, Identification Marking of U.S. Military Property.
- I. MIL-STD-461, Electromagnetic Interference Characteristics Requirements for Equipment.
- J. MIL-STD-462, Electromagnetic Interference Characteristics, Measurement of.
- K. MIL-STD-463, Definitions and System of Units, Electromagnetic Interference Technology.
- L. MIL-STD-810, Environmental Test Methods.
- M. MIL-STD-1186, Cushioning, Anchoring, Bracing, Blocking, and Waterproofing, with Appropriate Test Methods.
- N. MIL-C-3774, Crates, Wood, Open, 12,000-and-16,000.
- O. MIL-G-10924, Grease, Automotive and Artillery.
- P. MIL-G-23827, Grease, Aircraft And Instrument, Gear and Actuator Screw.
- Q. MIL-H-15424, Hand Tool, Packaging of.
- R. MIL-L-2104, Lubricating Oil, Internal Combustion Engine, Heavy Duty.
- S. MIL-L-10295, Lubricating Oil, Internal Combustion Engine, Sub-zero.
- T. MIL-L-45199, Lubricating Oil, Internal Combustion Engine (High Output Diesel).
- U. MIL-P-116, Preservation, Methods of.

STATEMENT #2 UNCLASSIFIED

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- V. MIL-M-18058, Machinery, Metal and Woodworking, Support Equipment and Associated Repair Parts, Preparation for Delivery Of.
- W. MIL-T-704, Treatment and Painting of Materiel.
- X. MIL-W-52574, Welding and Welding Procedure, Requirements for Manufacture of Equipment Utilizing Steels.
- Y. FED-STD-151, Metal, Test Methods.
- Z. NEMA MG-1 National Electric Manufacturer's Association, Tests and Performance - AC and DC Fractional and Integral Horsepower Motors Part 12, 1966.
- AA. Joint Industrial Council EGP-1-1967, Electrical Standards For General Purpose Machine Tools.
- AB. MTP 9-2-503, Durability.
- AC. MTP 9-4-001, Desert Environmental Test of Construction, Support and Service Equipment.
- AD. MTP 9-4-004, Arctic Environment Test of Construction Equipment.
- AE. MTP 9-4-003, Tropic Environmental Test of Construction, Support and Service Equipment.
- AF. MTP 10-2-500, Physical Characteristics.
- AG. MTP 10-2-501, Operator Training and Familiarization.
- AH. MTP 10-2-503, Surface Transportability (General Supplies and Equipment).
- AI. MTP 10-2-505, Human Factors Evaluation.
- AJ. MTP 10-2-507, Maintenance Evaluation.
- AK. MTP 10-2-508, Safety.
- AL. MTP 10-2-511, Quality Assurance.
- AM. MTP 10-2-512, Reliability.

5. SCOPE

5.1 SUMMARY

This Materiel test procedure describes the preparation for and methods of evaluating the technical characteristics of floor mounted cutters. The required tests are summarized as follows:

- a. Preparation for Test - A determination of the condition and physical characteristics of the test item upon arrival. Also, to ensure that the test item is complete and functionally operational and to provide operator training and familiarization procedures.
- b. Operational Performance Tests - An evaluation to examine specific operational design characteristics including the test items ability to perform its primary function. Test item controls and indicators will also be evaluated and checked.
- c. Electromagnetic Interference - An evaluation to determine the degree to which the test item produces radiated or line conducted interference.
- d. Climatic Extremes Tests - Performance testing of the test item under arctic and desert conditions.
- e. Intermediate Climatic Tests - Laboratory testing of the test item's ability to resist the effects of the extremes of the Intermediate Climate as defined by Army Regulation 70-38. The following evaluations are required:

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1) Corrosion Tests

- a) Salt Spray Test.
- b) Synthetic Sea - Water Spray Test.
- c) Intergranular - Corrosion Test for Corrosion Resistant Austenitic Steels.
- d) Intergranular - Corrosion Test for Aluminum Alloys.
- e) Mercurous - Nitrate Test for Copper Alloys.

2) Sand and Dust Test

f. Durability - An evaluation to determine the test item's ability to withstand long periods of normal or cyclic operation without serious degradation to operational performance or physical characteristics.

g. Transportability - An evaluation to determine test item ability to withstand the forces it will experience during normal handling and transportation.

h. Maintenance - An evaluation to determine and appraise the test item's maintenance characteristics and requirements, a verification and appraisal of its malfunctions, an evaluation of the test item's associated publications and other common and special support elements (maintenance test package), an appraisal of the test item's design for maintainability (AMCP 706-134: accessibility, ease of maintenance, standardization, and interchangeability), an evaluation of component and system durability and reliability, and the calculation of indicators which express the effects of appropriate preceding aspects.

i. Safety - An evaluation to determine the test item compliance with safety requirements and to confirm the test item's safety characteristics during conduct of all tests.

j. Human Factors Evaluation - An evaluation to determine the adequacy of the design and performance characteristics of the test item and associated equipment in terms of conformance to accepted human factors engineering design criteria. The sound noise level of the test item will also be determined

k. Value Analysis - An evaluation directed at analyzing the primary functions and features of the test item for the purpose of reducing the cost of the test item without compromising the desired performance and safety characteristics.

l. Quality Assurance - A review to determine and evaluate defects in material and workmanship.

5.2 LIMITATIONS

None

6. PROCEDURES

6.1 PREPARATION FOR TEST

6.1.1 Initial Inspection

6.1.1.1 Shipping and Packaging Inspections

a. Examine the shipping method, preservation and packaging and determine any nonconformance with the following:

- 1) Wooden crates - MIL-C-3774.
- 2) Preservation, packaging, and packing of test item, support equipment and repair parts - MIL-P-18058.
- 3) General preservation requirements - MIL-P-116.
- 4) Container markings - MIL-STD-129.
- 5) Packaging of provided hand tools - MIL-H-15424.
- 6) Blocking, bracing and anchoring procedures - MIL-STD-1186.

b. Record the following:

- 1) Evidence of damage or deterioration to packing or shipping components and materials.
- 2) All identification markings.

c. Remove the test item from its shipping carrier, or container, and record the following:

- 1) All printed material accompanying the test item and agreement with test item markings.
- 2) Equipment, time and personnel required.
- 3) Comments regarding the method and materials used to secure the test item.

6.1.1.2 Test Item Inspection

The test item will be marked in accordance with MIL-STD-130 and in addition, the test item will be visually inspected for evidence of defects, damage, and wear in its manufacturing, materials, and workmanship. In particular, the following must be considered:

a. Metal surfaces will be treated for rust and/or painted in accordance with MIL-T-704.

b. Component junctions.

- 1) Bolted connections - Bolt holes will be accurately punched or drilled and shall have the burrs removed. Lockwashers shall be provided for all bolts, nuts, and screws. All fastenings will be tight.
- 2) Riveted connections - Rivet holes will be accurately punched or drilled and have the burrs removed. Rivets will completely fill the holes. Rivet heads will be full, neatly made, concentric with the rivet holes, and in full contact with the surface of the member.
- 3) Welding will be in accordance with MIL-W-52574 and will be free from slag, cracks, fractures, and have a smooth clean appearance.

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- 4) Seams, joints and edges will have a good fit and alignment with no sharp edges or burrs.

6.1.2 Inventory Check

Verify completeness of the test item and associated parts and material with the Basic Issue Item List (BIIL) and file an Equipment Performance Report (EPR), if required. Where applicable, the following will be included:

- a. Repair parts.
- b. Maintenance tools.
- c. Technical publications.
- d. Accessories such as cutting tools, collets, face plates, chucks, taper attachments, tool holders, arbors, etc.

6.1.3 Physical Characteristics

The physical characteristics of the test item will be determined by performing the applicable sections of MTP 10-2-500 and in particular the following:

- a. Code markings - Note the legibility of test item markings and record all data.
- b. Dimension and weight data - Record the dimensions and weights of all assembly components.
- c. Test item specifications - Record the following; as applicable. (All dimensions in inches unless otherwise denoted.)

- 1) Type of machine
- 2) Type of work holddown (i.e., mechanical or hydraulic)
- 3) Dimensions of work area
- 4) Floor-to-table height
- 5) Motor-horsepower, flywheel RPM, strokes/minute
- 6) Maximum use opening
- 7) Distance between side housings
- 8) Holddown to knife edge
- 9) Maximum capacity of holddowns (thickness)
- 10) Total holddown pressure (tons)
- 11) Rake (shear angle) taper per foot; if adjustable; (range)
- 12) Dimensions of cutting blades
- 13) Length of shuttle feed loading table
- 14) Maximum distance between blade and work table

6.1.4 Operator Training and Familiarization

Test personnel will undergo the applicable procedures of MTP 10-2-501 and in particular the following will be performed:

- a. Instruct and train the test personnel in the safety, operation, and maintenance of the test item utilizing the technical manuals.
- b. Test personnel must be informed of the objectives and be

knowledgeable in the procedures of the tests to be performed.

c. Record all personal data required for the selected test personnel.

6.1.5 Preoperational Checks

Perform the following:

a. Depreservation and assembly - remove all preservation from the test item and attach any devices, etc., which were removed from the test item for transporting convenience. Record all depreservation and assemblies procedures required.

b. Lubrication - verify completeness of the lubrication program of the test item by the consideration of and examining for the following:

- 1) Oil holes, grease fittings, and drain plugs shall be accessible for service without disassembly but designed to exclude foreign material.
- 2) Pressure release fittings will be included where the pressure of lubricating equipment can damage grease seals.
- 3) Grease lubrication will be in accordance with the following:
 - a) MIL-G-23827 - for all instruments and sealed bearings. (Military lubricants are not required for sealed bearings which cannot be disassembled and relubricated.)
 - b) MIL-G-10924 - for other applications where operating temperatures do not exceed 175°F.
 - c) MIL-G-23827 - for other applications where operating temperatures do not exceed 250°F.
- 4) Oil lubrication of the power train, transmission, and hydraulic system shall be as follows:
 - a) MIL-L-2104 and MIL-L-45199 - high temperature operation
 - b) MIL-L-10295 - low temperature operation
- 5) A lubrication tag or chart will be attached to the test item with the following information:
 - a) Points of application
 - b) Service interval
 - c) Type of lubricant
 - d) Viscosity
 - e) Military specification number
 - f) Temperature range
- 6) Units provided with reservoirs, reservoir level gauges, filters and pumping systems to the tool post will have all of these features checked for proper operation.

c. Units requiring the application of electrical power will have the following preliminary electrical measurements performed:

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- 1) Continuity and short - using an ohmmeter, check power input leads and ensure that only the building ground lead is connected to the test item housing and that no shorts exist between the other leads.
- 2) Dielectric strength - using a dielectric strength tester, (0-3000VRMS, 25-60 Hz) test each electrical circuit.
- 3) Insulation resistance (IR) - using a 500 vdc megohmmeter, check each electrical circuit for insulation resistance.

d. Controls, adjustments, and indicators (mechanical and electrical).

- 1) Prepare a table listing all devices which control, indicate, or change the operating characteristics of the test item. Arrange the table in the following manner with examples shown:

Electrical Controls	Electrical Indicators	Mechanical Controls	Mechanical Indicators
Switches Rheostats	Lights Readouts Meters	Levers Wheels Locks Adjustments	Dials Level Gauges

- 2) For each device listed, evaluate and check for the following:
 - a) Operation is correct
 - b) Effect on test item is as required
 - c) Operation is smooth
 - d) Absence of binding, rubbing
 - e) Calibration is proper
 - f) Changes in test item are monitored and displayed correctly
 - g) Range is correct

e. Test safety and test item protective devices such as limit, overload, overtravel, and interlock switches shall be checked for proper operation.

6.2 TEST CONDUCT

- NOTE:
1. All equipment malfunctions shall be reported by EPR in accordance with USATECOM Regulation 70-23.
 2. The test officer will review and implement the safety requirements of paragraph 6.2.8 prior to initiating test procedures.

6.2.1 Operational Performance

6.2.1.1 Operational Test

Perform the following:

- a. Apply power to the cutter.
- b. Operate at no load continuously for not less than 30 minutes.
- c. Check all controls, adjusting mechanisms, etc., for proper operation.
- d. Observe that all parts function smoothly and without evidence of binding, abrupt changes in motion, excessive noise, etc.

6.2.1.2 Machine Balance Test (Mechanical Type)

Perform the following:

- a. Obtain a vibration measuring test set.
- b. Set the test item speed control to its maximum value.
- c. Measure and record in inches the amplitude of vibration at various locations on the test item.
- d. Make several starts and stops of the drive system to determine the absence of impulsive mechanical shocks to the test item.

6.2.1.3 Input Consumption Test

Measure and record the rate at which the test item when running full speed under no load, consumes its input by the following:

- a. For pneumatic motors use an in-line pressure gauge and flow meter to measure and record the pressure, (psia) and flow, (cu.ft./min), respectively.
- b. For fuel consuming engines measure and record the rate in liquid volume/unit time.
- c. For electrical motors, use wattmeters in the power leads to record consumption in watts.

6.2.1.4 Speed Tests of Moving Components

All devices equipped with moving components, (rotating wheels, linear tables, etc.) will be tested for the rate of motion by the following:

- a. Obtain speed measuring equipment such as stroboscope, tachometer-counter combination, etc.
- b. Apply power and set components into motion.
- c. Measure and record the rate of motion of each moving surface by the following:
 - 1) Reciprocating surfaces will have the number of cycles/minute measured, a cycle being composed of one forward and one reverse stroke.
 - 2) Circular surface speed will be measured in rpm.
 - 3) Band type (non-ending) surfaces will be measured and recorded in ft. of cutting surface per second.
- d. Surfaces which have more than one speed, either discrete settings or continuously variable will have each discrete setting checked and the range checked respectively (a minimum of 10 readings over the range).

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6.2.1.5 Power Line Variation Test

Units equipped with electric motors will be evaluated as follows:

- a. Connect a line autotransformer to the test item with voltmeters in the line to indicate the input voltage.
- b. Apply power and adjust the autotransformer to obtain rated line voltage.
- c. Record the no-load speed of the cutting device (rpm, fpm, whichever is appropriate).
- d. Alternately raise and lower the line voltage by 10% of rated and for each setting record again the cutting device speed.

6.2.1.6 Power Brake Test

Units equipped with power brakes will be checked as follows:

- a. Have the unit running no-load at rated speed.
- b. Actuate the power brake and record the time, in seconds, required to decelerate and stop the moving surface.

6.2.1.7 Mechanical Overload Test

The ability of the test item to compensate for mechanical lock of the cutting device will be ascertained by performing the following:

- a. Using a clamp or other similar device, lock the cutter so that it will be unable to move when power is applied to the test item.
- b. Apply power to the unit.
- c. Mechanical systems will provide an automatic disconnect of the drive to the cutter.
- d. Electrical overloads will operate, stop the drive and indicate the condition.
- e. Record the time, in seconds, for each device to operate.
- f. Operate the manual reset to allow the test item to return to normal operating conditions.

6.2.1.8 Alignment Test

Verify that the side gauges are square with respect to the cutting edge by performing the following:

- a. Place a one-foot square section of medium steel, thickness equal to the maximum capacity of the machine, flush against each side gauge.
- b. Operate the cutter to shear each test section in half.
- c. Rotate each test section 90° so that the cut edge is against the respective side gauge.
- d. Operate the cutter to shear this test section in half.
- e. Measure the angle between the cut edges of each test section with a level protractor.
- f. Repeat test on 4 additional test panels.

- g. Inspect test item for indications of wear or failure.

6.2.1.9 Performance Test

Perform the following:

- a. Operate the test item to cut 10 parallel sections of maximum width, maximum thickness medium steel at the highest cutting rate of the machine.
- b. Measure the time required for each cut and the total time required for setup, cutting, feeding, etc.
- c. Repeat the test for 10 sections of maximum width, minimum thickness medium steel.
- d. Determine, with a straight edge, that the cut edges are straight.
- e. Measure each section at several locations to determine that the cuts made resulted in parallel edges for each piece.
- f. Measure the cut edges of the maximum thickness test sample with a level protractor to determine that the cut face is perpendicular to the sheet surface.
- g. Inspect the edges of the minimum thickness test samples for evidence of warpage, curling or tearing as a result of test item operation.
- h. Inspect the cutting edges of the test item for evidence of wear, notching, dulling, or failure.

6.2.2 Electromagnetic Interference

This test is required on all test items which require the application of external electrical power for control and/or drive units. The test will be conducted in accordance with the requirements of MIL-STDs-461, 462, and 463. In particular, the subtests required by MIL-STD-461, Class IIB equipment, shall consist of the following:

<u>TEST</u>	<u>DESCRIPTION</u>
CE03	150 KHz to 50 MHz, Power Leads
CE05	30 Hz to 50 MHz, Inverse Filter Method
RE01	0.03 to 30 KHz, Magnetic Field
RE02	150 KHz to 400 MHz, Electric Field
(T) RE04	0.02 to 50 KHz, Magnetic Field

Perform the following:

- a. Obtain the measuring equipment and antennas required by MIL-STD-461.
- b. Calibrate the equipment where required.
- c. Have the test item in a normal operating configuration under the test conditions specified by MIL-STD-462.
- d. Conduct the subtests listed above, recording frequencies and levels of interference.
- e. Compare the interference readings against the allowable limit graphs of MIL-STD-461 and note out-of-tolerance readings.

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6.2.3 Climatic Extremes Tests

Performance testing of each test item type under arctic and desert conditions should be performed in accordance with MTP's 9-4-001 and 9-4-004. Additional guidance may be obtained from MTP 9-4-003.

6.2.4 Intermediate Climatic Tests

Subject the test item(s) to climatic conditions representative of the Intermediate Climate as defined by AR 70-38. Use procedures and applicable tests contained in MIL-STD-810 or Federal Test Method Standard No. 151, as applicable.

6.2.4.1 Corrosion Tests

6.2.4.1.1 Salt Spray Test - Determine the test items ability to resist corrosion when subjected to a fine mist of 5 percent sodium chloride solution at a temperature of 95°F. This test is applicable for test item assemblies, metallic coatings, organic and inorganic coatings on metals, and many non-metallic materials. Perform in accordance with Method 811.1 of Federal Test Method Standard No. 151. Record details of test conduct and the effect of the test on the test item.

6.2.4.1.2 Synthetic Sea-Water Spray Test - Determine the test items ability to resist corrosion when subjected to a fine mist of synthetic sea water at a temperature of 75°F. This test is applicable for tools made of certain types of steel which are subject to localized pitting attack. Perform in accordance with Method 812 of Federal Test Method Standard No. 151.

6.2.4.1.3 Intergranular-Corrosion Test for Corrosion Resistant Austenitic Steels - Determine the test items ability to resist corrosion when subjected to an acidified copper-sulfate solution following a sensitized, descaling, and immersion procedure. This test is applicable for tools made of stabilized extra-low-carbon, and annealed unstabilized steel. Perform in accordance with Method 821.1 of Federal Test Method Standard No. 151.

6.2.4.1.4 Intergranular-Corrosion Test for Aluminum Alloys - Determine the susceptibility of aluminum alloy test items to intergranular corrosion. Perform according to Method 822 of Federal Test Standard No. 151.

6.2.4.1.5 Mercurous-Nitrate Test for Copper Alloys - Determine the susceptibility of copper alloy test items (such as non-sparking tools) to fail in use or storage due to stress-corrosion cracking. Perform according to Method 831 of Federal Test Standard No. 151.

6.2.4.2 Sand and Dust Test

Perform the sand and dust test, Method 410 of MIL-STD-810, and record all test results. At the completion of the sand and dust test, examine

and inspect each test item type for the effects of sand and dust, including the following:

- a. Abrasion to test item moving parts
- b. Test item coatings damaged
- c. Test item parts which were caused to bind by sand or dust
- d. Damage to measuring tool scales

6.2.5 Durability

Perform the applicable procedures of MTP 9-2-503 and the following:

a. Operate the test item continuously for 24 hours, performing a cutting operation for a minimum of 15 minutes during each one hour period of the subtest. Include the following:

- 1) Provide means for monitoring the rate at which the power plant consumes its input, e.g. wattmeters for units powered by electrical motors.
- 2) Attach temperature measuring devices, thermocouples, thermometers, etc. to the drive housing and/or motor.
- 3) For the cutting operation, obtain 24 samples (one for each hour) of the hardest material specified for the device and arrange for cutting at the rated capacity.
- 4) Apply power to the unit and run at maximum speed and record the starting time.
- 5) Using one of the test material samples, perform cutting operations for at least 15 minutes each hour. Record any gross changes in performance characteristics.
- 6) At the end of each elapsed hour record the consumption rate of the power unit, e.g. watts, gallons, etc., and the temperature, °F.

NOTE: In the event of equipment malfunction during the durability test, the procedures of the maintenance section will be performed and the durability test rerun following repair.

b. When the test is complete, examine the complete assembly for any damage or signs of accelerated physical wear, including the following:

- 1) Rust, discolored or missing paint
- 2) Loose or missing hardware
- 3) Open or loose seams
- 4) Leakage in air or fluid lines
- 5) Broken parts
- 6) Uneven or excessive wear in moving components
- 7) Excessive temperatures on the test item housings
- 8) Loss of adjustment or control
- 9) Slippage or loose components

c. Note the following for each defect revealed in paragraph b, above.

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- 1) Nature of the defeat.
- 2) Location on the test item.
- 3) Cause (if known).
- 4) Suggested corrective action to preclude a reoccurrence of the defeat or failure in the future.

6.2.6 Transportability

NOTE: The draft technical manual shall be reviewed or consulted for proper procedures for tying down, lifting and transporting the test item by various media. Any inadequacy of instructions should be reported by an EPR.

Perform the applicable portions of MTP 10-2-503

6.2.7 Maintenance

Evaluate the maintenance-related factors of the test item as described in MTP 10-2-507 and MTP 10-2-512.

- a. Organizational (O), Direct Support (F), and General Support (H) maintenance requirements.
- b. Operator through General Support Maintenance Literature.
 - c. Repair Parts.
 - d. Calibration standards and facilities.
 - e. Test and handling equipment.
 - f. Maintenance facilities.
 - g. Personnel skill requirements.
 - h. Maintainability.
 - i. Reliability.
 - j. Availability.
 - k. Tools.

NOTE: Ensure that the data collected will permit the computation of M & R indicators such as MR, MTBF, MTTR.

6.2.8 Safety

Evaluate the safety characteristics and features of the test item in accordance with the applicable procedures of MTP 10-2-508.

NOTE: Provide a safety recommendation in accordance with the provisions of USATECOM Regulation 385-6.

6.2.9 Human Factors Evaluation

6.2.9.1 General Evaluation

Throughout the test, evaluate the effectiveness and characteristics of the man-item interaction as related to human factors by performing the

applicable sections of MTP 10-2-505 and the following:

a. Prepare checklists to evaluate the human factor characteristics using Human Factor Evaluation Data for General Equipment (HEDGE) for the class III C equipment. Checklists will provide spaces for user personnel to rate the test item (components and procedures) for performance of those tasks as either satisfactory or not satisfactory from a human factors standpoint. Where conditions permit, the HEDGE requirements will be integrated into and conducted simultaneously with corresponding tests. The evaluation shall include but not be limited to the following:

1) Operability:

- a) Assemble components, move to test site, and place in position.
- b) Make all external connections.
- c) Make preliminary alignment, calibrate and adjust.
- d) Check controls, fasteners and connectors.
- e) Load expendables (lubricants, etc.), close covers, caps, etc.
- f) Turn on electrical power, operate-manipulate controls, observe indicators, observe effect on material, and remove finished product.

2) Maintainability:

- a) Perform preventative maintenance - clean and add lubricants, remove and replace minor items, tighten fasteners and connectors; adjust calibrate and align.
- b) Perform non-scheduled maintenance - detect malfunctions, isolate and identify causes by visual means or instrumentation.
- c) Remove and replace - open, gain access to and remove component. Replace or repair and re-establish proper operation.

3) Transportability:

- a) Prepare for transport - place in the transit state by removals, tightening, locking, removing fluids and apply protective cover. Package/containerize the test item.
- b) Load/unload - move the test item by appropriate MHE to the carrier and place into/onto the carrier.
- c) Secure/unfasten - Tie down or secure, open container, remove and reinstall test item.

b. Evaluation of the tasks of step a, shall include but not be limited to the following:

1) Title of tasks conducted

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- 2) Adequacy of instructions and tools to perform task
- 3) Ease of performing task
- 4) Design of test item as it affects the task
- 5) Time and personnel required for task

6.2.9.2 User Environment Human Factors Evaluation

As part of the human factors evaluation, test personnel should examine the test item as a possible source of disturbance, irritation, hazard, etc., to the environment and personal health of user personnel. Table I lists items to be considered, effects and measurement methods to evaluate the level of disturbance. All categories in the table may not be applicable nor is the table complete, it is intended only to present examples. From the table the following sound test will be performed:

6.2.9.2.1 Preparation for Test

a. Determine the measuring locations for the microphone around the test item, using the following criteria:

- 1) The test item shall be in its normal operating position.
- 2) There should be no obstructions between the measuring microphone and the test item.
- 3) Measuring locations for the microphone shall be approximately every 20° along a circular path whose radius is approximately ten feet from the approximate geometric center of the test item.
- 4) No measurements should be taken at plus or minus 30° with respect to the normal leading to an open inlet or outlet.

b. Encase the microphone in a sound absorbing enclosure which will be open only on the side facing the test item to minimize indirect reflections.

6.2.9.2.2 Test Conduct

a. Calibrate the Sound Level Meter and set the weighting network switch to the "flat response" or C position.

b. Determine the highest sound pressure level in each band over all the bands at each location, (Table II) with the test item operating at a normal level.

c. With the test item inoperative, determine the ambient noise level for the point of highest sound pressure in each band.

6.2.10 Value Analysis

Throughout all tests, the test item shall be examined for any unnecessary, costly, "nice-to-have" features as described in USATECOM Regulation 700-1. Perform the following:

- a. Examine the test item in the following cost reduction areas:

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TABLE I

<u>FACTOR</u>	<u>EFFECT</u>	<u>MEASUREMENT</u>
a. Sonic noise.	Annoyance and detrimental effects to hearing.	Sound test.
b. Emission of smoke or gas.	Aggravation to sight and breathing.	Chemical analysis of air sample.
c. Glare due to reflected light.	Retards vision.	Light meter test.
d. Radiation.	Internal damage to human tissue.	Film patch or Roentgen meter (dosimeter).

TABLE II

SERIES 2 FREQUENCY ANALYSIS

BAND	FROM	TO	CENTER FREQUENCY*	MAX. STEADY STATE NOISE LEVEL
1	45	90	63	119
2	90	180	125	114
3	180	355	250	107
4	355	710	500	99
5	710	1400	1000	91
6	1400	2800	2000	89
7	2800	5600	4000	89
8	5600	11,200	8000	91

*Defined as geometric mean of cut-off frequencies.

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- 1) Deletion of ineffective or unnecessary features or components.
- 2) Substitution of less expensive but comparable components or material.
- 3) Changes in the design to reduce the cost of manufacturing.

b. Examine all proposals to determine that the performance and safety characteristics have not been lowered.

c. Record the following for each suggested change:

- 1) Component or feature involved
- 2) Suggested change
- 3) Reasons for the suggestions

6.2.11 Quality Assurance

Determine the quality of the test item as described in the applicable section of MTP 10-2-511.

6.3 TEST DATA

NOTE: In compiling the Test Data section, test personnel should expound upon those data procedures which are other than quantitative in nature by recording narrative descriptions and/or events occurring during the conduct of the test.

6.3.1 Preparation for Test

6.3.1.1 Initial Inspection

6.3.1.1.1 Shipping and Packaging Inspection

Record the following:

- a. Any noncompliance with the standards for shipping, marking, preservation, and packaging.
- b. Evidence of damage, identification markings, and list of printed matter enclosed.
- c. Equipment, time, and personnel required to unpack the test item and comments concerning the method and materials used in packing.

6.3.1.1.2 Test Item Inspection

Record the following:

- a. Any instances of noncompliance with the marking requirements of MIL-STD-130.
- b. Evidence of defects in the manufacturing, materials, and workmanship or nonconformance with referenced standards.

6.3.1.2 Inventory Check

Record any materials missing from the Basic Issue Item List.

6.3.1.3 Physical Characteristics

Record the data required by MTP 10-2-500 and the following:

- a. Test item code markings
- b. Dimension and weight data
- c. Test item specifications
 - 1) Machine type
 - 2) Accessory device characteristics
 - 3) Surface speed or range of speeds; ft./sec.
 - 4) Accuracy - finish of ground surface, microinches rms.
 - 5) Power or fuel consumption rate
 - 6) Mounting
 - 7) Environmental limitations (if any)

d. Any instances where components are not in accordance with listed specifications.

6.3.1.4 Operator Training and Familiarization

Record the data required by MTP 10-2-501 and the following:

- a. Methods used and completion of test personnel training and evaluation of the technical manuals.
- b. Evidence that the test personnel are sufficiently knowledgeable in objectives and procedures.
- c. The personal data required for selected personnel.

6.3.1.5 Pre-operational Checks

Record the following:

- a. Depreservation procedures utilized.
- b. Any assembly required.
- c. Lubrication procedures, materials, and data on tag.
- d. Ineffective or inoperative coolant system including proper flow rate, reservoir level indicator, controls, etc.
- e. Preliminary electrical tests.
 - 1) Shorted or open power leads or unconnected ground lead
 - 2) Dielectric test failures, identify the circuit
 - 3) The insulation resistance (IR) in megohms
- f. Limit, overload, overtravel and interlock switches which do not function properly.
- g. For all controls and indicators listed in the table, (para. 6.1.6 d. 1) above, list beside each item any of the following conditions.

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- 1) Improper operation
- 2) Desired effect on test item not indicated
- 3) Binding, rubbing or jerking in motion
- 4) Improper calibration
- 5) Proper monitoring and display of test item conditions
- 6) Range too small, too large, etc.

6.3.2 Test Conduct

6.3.2.1 Operational Performance

6.3.2.1.1 Operation Test

Record the following:

- a. Improperly operating controls or adjustments.
- b. Any signs of improper operation, noise, etc.

6.3.2.1.2 Machine Balance

Record the following:

- a. The vibration amplitude, inches of displacement, at the selected measuring locations.
- b. Any evidence of excessive shock during start and stop operations.

6.3.2.1.3 Input Consumption

Record the rate of consumption in accordance with the following:

- a. Pneumatic motors - air pressure, psia and flow rate cu.ft./min.
- b. Fuel burning engines - gallons/hour.
- c. Electrical motors - watt hours.

6.3.2.1.4 Speed Tests of Moving Components

Record the rate of motion of each moving surface on the test item. Where there is more than one discrete speed, record each setting. Where the speed is continuously variable record 10 readings over the range.

- a. Reciprocating surfaces-cycles/min.
- b. Circular surfaces rpm.
- c. Lineal travel surfaces - inches/min.

6.3.2.1.5 Power Line Variation

Record the following:

- a. Voltage and no-load speed at rated line voltage.
- b. Voltage and no-load speed at -10% rated line voltage.
- c. Voltage and no-load speed at +10% rated line voltage.

6.3.2.1.6 Power Brake

Record the surface stopping time, in seconds.

6.3.2.1.7 Mechanical Overload

Record the following:

- a. Failure of mechanical disconnect system to operate.
- b. Proper operation of electrical overload devices and indicators.

6.3.2.2 Alignment Test

Record the following:

- a. Measured angle of sheared edges.
- b. Evidence of test item wear, distortion or dulling of cutting edges.

6.3.2.3 Performance Test

Record the following:

- a. Time required to perform each cut.
- b. Measurements made on all test sections and range of measurements on each section.
- c. Cut angle of test samples with respect to sheet surface.
- d. Indications of warpage or irregular shearing due to misalignment or malfunction of the test item.
- e. Evidence of wear, notching or dulling of cutting edges.

6.3.2.4 Electromagnetic Interference

- a. Prepare a diagrammatic layout of the test site showing the test item and locations at which measurements were made.
- b. Record for each test and its frequency band, the frequency and its corresponding highest in-band interference reading.

6.3.2.5 Climatic Extremes Tests

Record data required by applicable procedures of MTP's 9-4-001, 9-4-004, and 9-4-003.

6.3.2.6 Salt Spray Test

Record data required by Method 811.1 of Federal Test Method Standard No. 151.

6.3.2.7 Synthetic Sea-Water Spray Test

Record data required by Method 812 of Federal Test Method Standard No. 151.

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6.3.2.8 Intergranular-Corrosion Test for Corrosion Resistant Austentic Steels
Record data required by Method 821.1 of Federal Test Standard No. 151.

6.3.2.9 Intergranular-Corrosion Test for Aluminum Alloys
Record the data required by Method 822 of Federal Test Standard
No. 151.

6.3.2.10 Mercurous-Nitrate Test for Copper Alloys
Record the data required by Method 831 of Federal Test Standard
No. 151.

6.3.2.11 Sand and Dust Test

Record the following:

- a. Data required by applicable procedures of MIL-STD-810, Method 410.
- b. Following test and visual inspection:

- 1) Abrasion to test item moving parts
- 2) Test item coatings damaged
- 3) Test item parts which were caused to bind by sand or dust
- 4) Damage to measuring tool scales

6.3.2.12 Durability

Record the following in addition to that required by MTP 9-2-503:

- a. The starting time and total elapsed test time, hours.
- b. The apparatus used to measure temperature and power plant consumption.
- c. Test materials used, and cutting rate.
- d. A table which in chronological order shows the temperature, °F, and power plant consumption rate, watt hours, gallons/min. which are recorded on each elapsed hour.
- e. Any malfunction or problems encountered during the cutting operations.
- f. Any lubrication procedures utilized.
- g. Post test physical examination.
 - 1) Damage to any component, material or finish
 - 2) Loosening of hardware, breaks in welds.
 - 3) Excessive temperatures on the enclosure
 - 4) Signs of leakage
- h. For each defect of subparagraph g., record the nature, location, and recommended remedy.

6.3.2.13 Transportability

Record the data required by MTP 10-2-503 and the following:

- a. The test used.
- b. The types, numbers, and heights of drop or other data required by the test.
- c. The locations and types of damage which the test item container exhibited and any breakage, shifting, etc. of the container contents.
- d. Any damage to the test item or impairment of its operating efficiency. Include details as to location and nature of the fault.

6.3.2.14 Maintenance

Record the data required by MTP 10-2-507, MTP 10-2-512 and the following:

- a. Deficiencies in the draft manual maintenance literature.
- b. Ineffective maintenance procedural instructions.
- c. Design defect in the test item which hinders maintenance procedures.
- d. Details of all maintenance procedures utilized.
- e. For each malfunction:
 - 1) Indication of the failure.
 - 2) Component or feature involved and the method used to determine it.
 - 3) Elapsed run time since previous test item failure.
 - 4) Total accumulated run time of the failing component.
 - 5) Any damage caused to associated parts of the test item by the failing component.
 - 6) Repair procedures followed, downtime, and personnel, material and tools required.

6.3.2.15 Safety

Record the data required by MTP 10-2-508 and the following:

- a. Comments regarding unsafe conditions found in the procedures of any test.
- b. For general safety characteristics:
 - 1) Poorly worded or unclear operating instructions.
 - 2) Warning labels - lacking, not conspicuous.
 - 3) Unshielded moving parts.
 - 4) Unprotected electrical circuits.
 - 5) Markings for environmental limitation .
 - 6) Unsafe procedures for flammables or explosive materials.
 - 7) Improperly protected machining area.
 - 8) Safety equipment not properly suggested or additional equipment required.
- c. Prepare a table to include the following:

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- 1) A list of all safety devices used on the test item.
- 2) The type of failure each device is to detect.
- 3) Indication that the device has successfully passed two cycles of operation.

- d. List any missing devices or unsafe conditions.
- e. List any suggested additions to the test item's safety features.

6.3.2.16 Human Factors Evaluation

6.3.2.16.1 General Evaluation

- a. Record the data collected as described in the applicable sections of MTP 10-2-505.
- b. Retain completed checklists.

6.3.2.16.2 User Environment Human Factors

Record the following:

- a. Factors which were considered in the evaluation.
- b. Test made and pertinent data for each test.
- c. Suggestions for remedial actions.
- d. For the sound test the following:
 - 1) A diagrammatic layout of the test site indicating the test item position and points at which measurements were made.
 - 2) The highest noise level in each band over all bands at each measuring location and the corresponding ambient noise level, at each of these frequencies with the test item inoperative.

6.3.2.17 Value Analysis

Record the following:

- a. Non-functional, costly, or "nice-to-have" features of the test item.
- b. Test personnel comments and opinions regarding features that might be eliminated.

6.3.2.18 Quality Assurance

Record data collected as described in the applicable section of MTP 10-2-511.

6.4 DATA REDUCTION AND PRESENTATION

Data obtained during the conduct of the test will be summarized making use of photographs and charts as appropriate. All photographs and charts will be properly identified and labeled. Test data will be summarized and evaluated as required.

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Data obtained for each performance characteristics will be compared with established technical performance characteristics as specified in QMR's, SDR's, or other developmental criteria. Where performance is repeated after a specific test or repair, the data obtained will be compared with the previously obtained data, and where definite differences occur, the conditions that caused the differences and the degree of difference will be summarized along with appropriate comments of the test personnel.

In addition to charts and photographs, the presentation shall include narrative reports of all phases of the test.

The presentation shall conclude with a summarization of the suitability of the test item for service testing.

A Safety Release Recommendation shall be submitted in accordance with USATECOM Regulation 385-6 based on the data collected related to safety.

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